Robotic Hull Bio-mimetic Underwater Grooming (Hull BUG)

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At a Glance

What is it?

- The Robotic Hull Bio-mimetic Underwater Grooming system, or Hull BUG, is an autonomous underwater hull grooming robot specifically designed to prevent the accumulation of marine fouling.

How does it work?

- The current developmental model of the Hull BUG uses four wheels and a negative pressure alternative device assembly for attachment to the hull. A suite of onboard sensors will provide obstacle avoidance, path planning and navigation capabilities that include detection of fouled and groomed surfaces.

What will it accomplish?

- By reducing marine fouling on ship hulls, the Hull BUG will help ensure peak ship performance, reduce fuel consumption associated with increased drag from accumulated biofouling, and decrease the U.S. Navy's carbon footprint. Risk of hull invasive species transfer may also be reduced.

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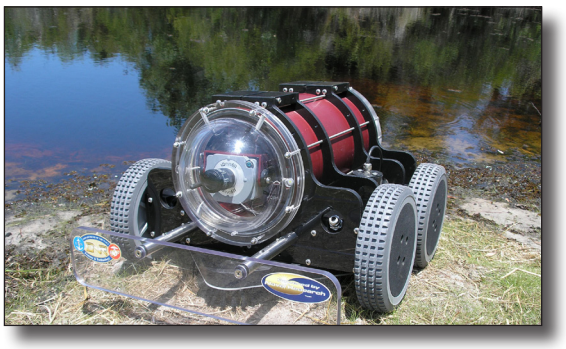

High-performance naval warships and submarines rely on critical design factors such as top speed, acceleration and hydroacoustic stealth to achieve their mission. Biofouling of ship hulls produces weight, adds roughness and increases drag—all of which reduce a vessel's fuel efficiency.

The Naval Surface Warfare Center, Carderock, estimates that vessel speed is reduced by up to 10 percent from biofouling, which can require up to a 40 percent increase in fuel consumption to counter the added drag. In fact, colonized barnacles and biofilms settled on the hull of a Navy ship translates into roughly $500 million annually in extra fuel and maintenance costs.

The Office of Naval Research (ONR) is developing the Robotic Hull Bio-inspired Underwater Grooming system, or Hull BUG, to prevent or suppress the growth of advanced biofouling. The Hull BUG is an autonomous vehicle designed to groom and maintain the hull surfaces of ships. In some ways its mission is similar to a robotic home floor cleaner, lawnmower or some advanced pool cleaners in that is is designed to be tether-free, autonomous and battery-powered for a significant duration of its mission. A variety of grooming tools are being considered including rotary brushes and specialized water jets to groom and maintain ship hull surfaces. Once developed, the Hull BUG platform could also provide other capabilities such as hull inspection and force protection.

The Hull BUG is being developed in ONR's Discovery and Invention Program. If successful, the technology will be further developed through the Future Naval Capabilities program with full ship demonstrations in the 2015 timeframe.

Research Challenges and Opportunities:

- Increases operational efficiency of Navy ships
- Increases period of time between dry dock intervals
- Allows new non-toxic technology coatings to be used
- Enables dual use applications by the commercial shipping industry to lower fuel use and decrease greenhouse gas emissions from ocean-going vessels